

**Aquatic Vegetation of Lake Thirteen
Cass County, Minnesota
(DOW 11-0488-00)
August 16, 2004**



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Summary

The aquatic plant community of Lake Thirteen, Cass County (DOW 11-0488-00), is representative of an undeveloped northern hard-water lake with sandy bottom substrates and moderate water clarity. In 2004, submerged vegetation was found to a depth of 10 feet and was dominated by muskgrass (*Chara* sp.). This macroalgae is a low-growing plant that can form thick carpets across the lake bottom and provides valuable habitat for invertebrates and fish. Muskgrass was found in 76 percent of the sample sites between shore and 10 feet. Bulrush (*Scirpus* sp.) occurred in scattered beds around the perimeter of the lake to a depth of five feet. Other native aquatic plant species found in Lake Thirteen included pondweeds (*Potamogeton* sp.), bushy pondweed (*Najas flexilis*), northern watermilfoil (*Myriophyllum sibiricum*) and white waterlily (*Nymphaea odorata*).

Introduction

Description of Survey Lake

Lake Thirteen (DOW 11-0488-00) is located about 13 miles north of the town of Walker in Cass County, Minnesota. It occurs within the ecological region known as the [Laurentian Mixed Forest Province](#) (Fig. 1).

Lake Thirteen is one of many smaller lakes and wetlands in the Leech Lake River Watershed. There are three ecological subsections in this watershed and Lake Thirteen is within the [Chippewa Plains subsection](#) (Fig. 2). Lake Thirteen lies to the northwest of Leech Lake and the Leech Lake River drains the watershed to the northeast (Fig. 2).

The drainage network throughout Chippewa Plains

Figure 1. Location of Lake Thirteen in Minnesota.

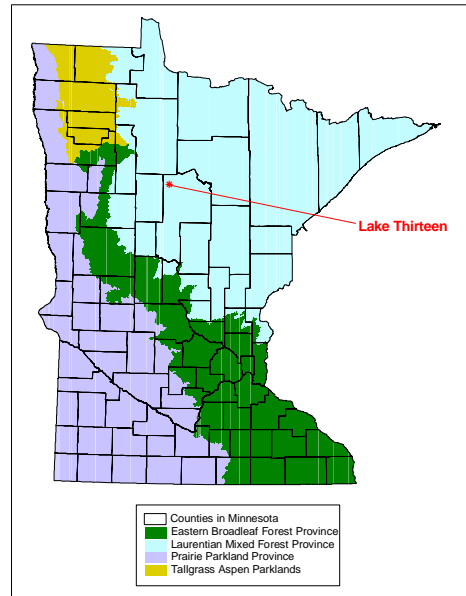
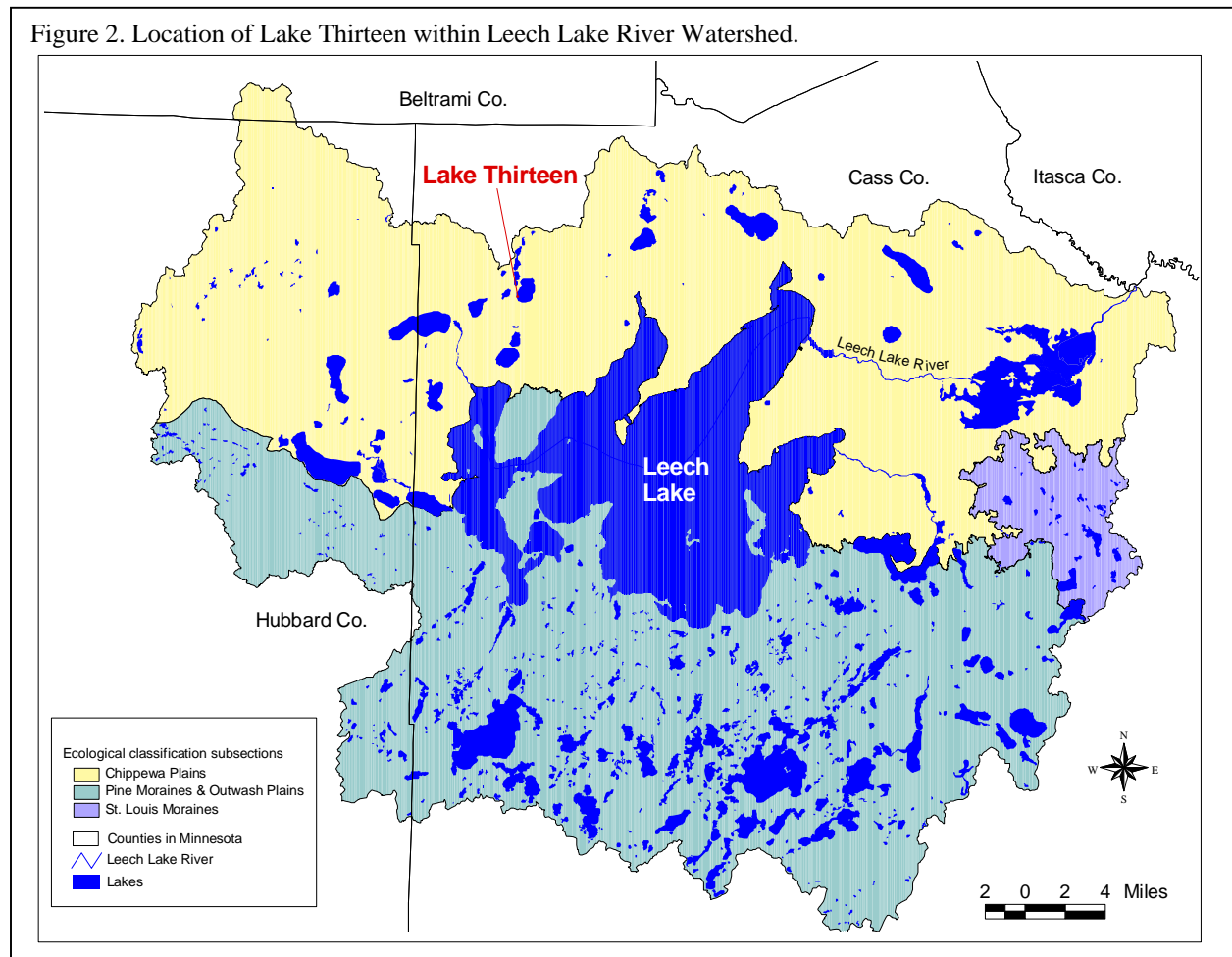
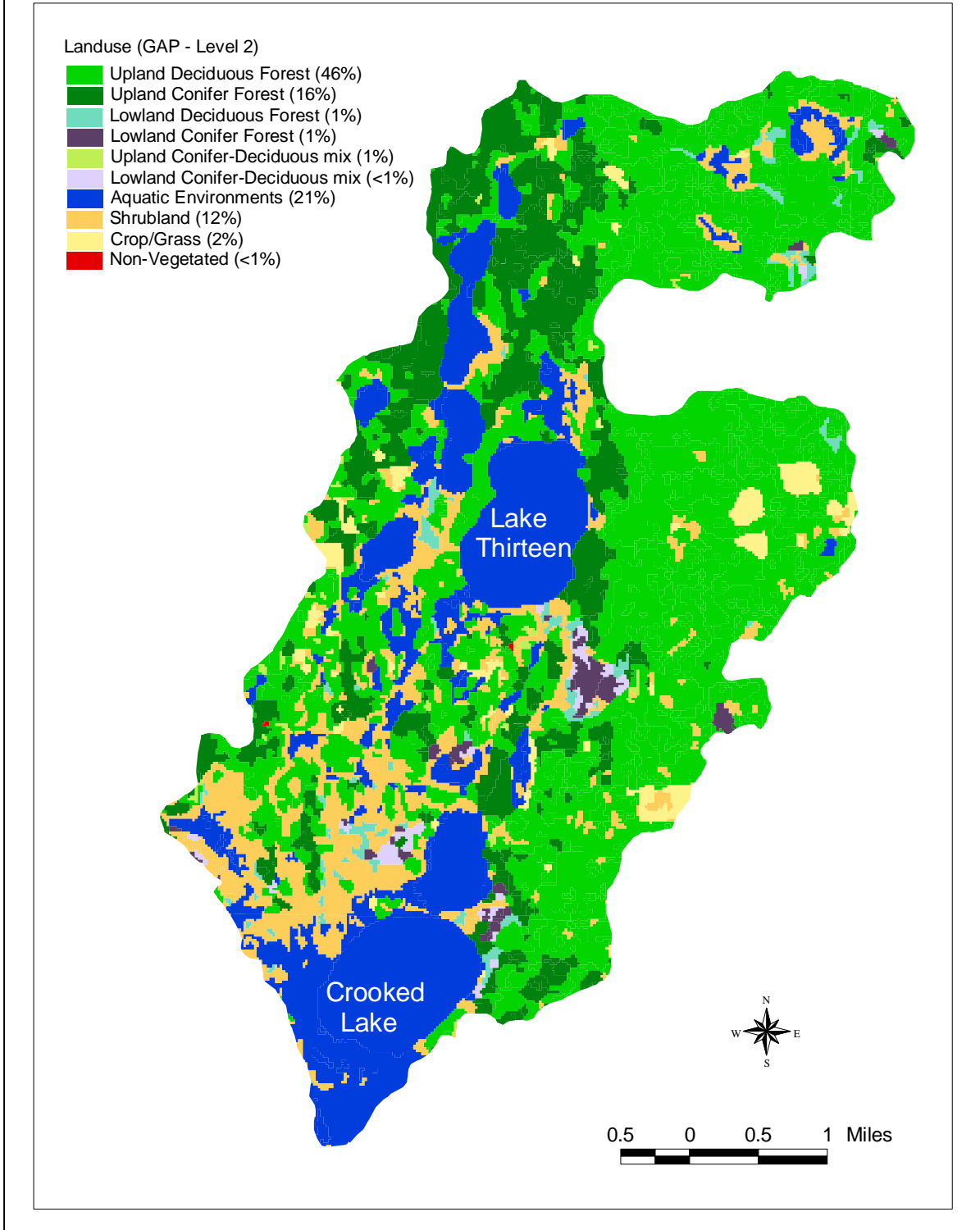


Figure 2. Location of Lake Thirteen within Leech Lake River Watershed.



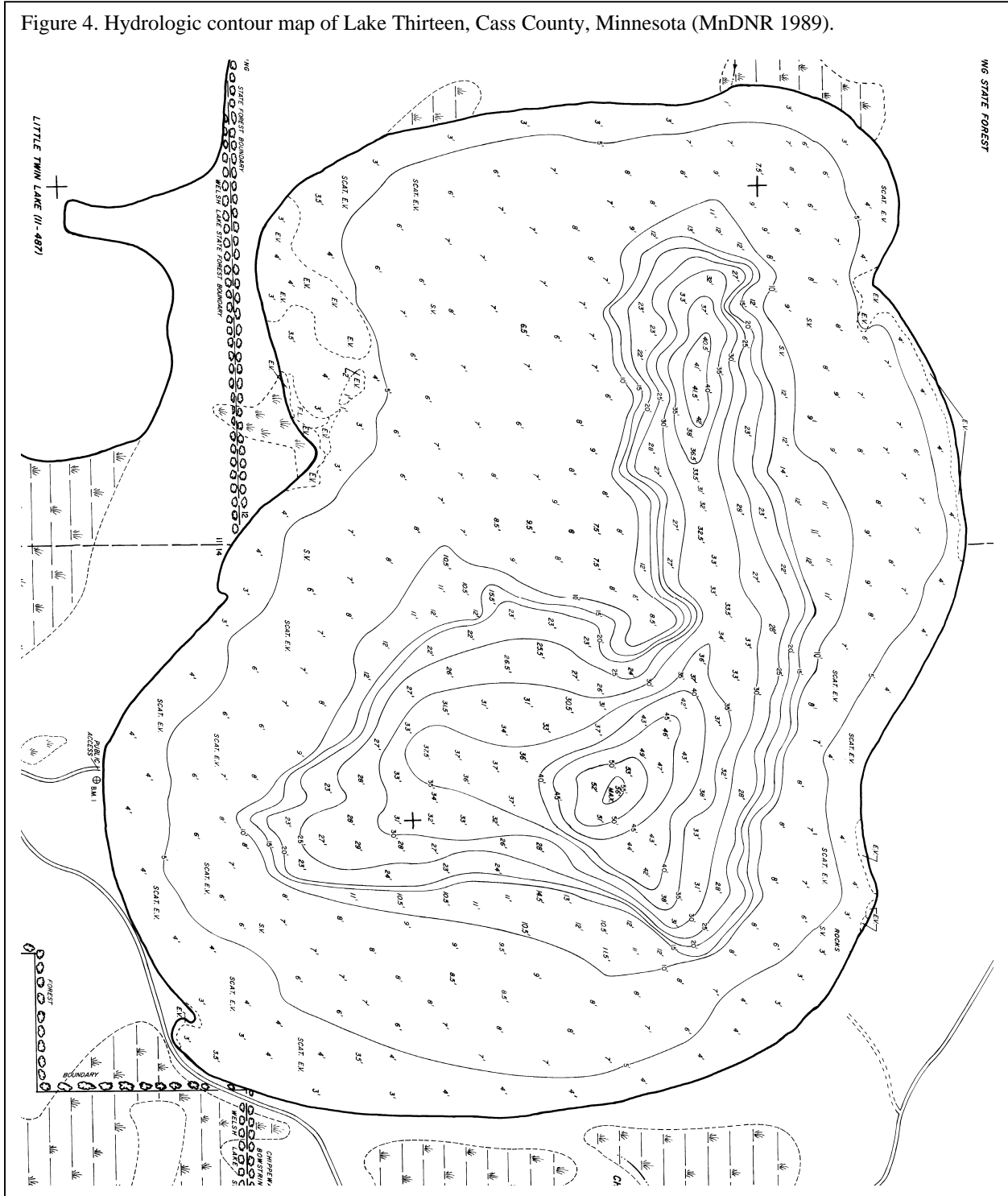
subsection is poorly developed due to the age and characteristics of the landforms. Lake Thirteen is primarily landlocked but receives some flow from a wetland to the north. The sub-watershed of Lake Thirteen is primarily forested and the lake is bordered by upland deciduous and upland conifer forest (Fig. 3).

Figure 3. Land Use of sub-watershed containing Lake Thirteen.



Lake Thirteen is within the Leech Lake Indian Reservation and the surrounding riparian lands are within public ownership including the Chippewa National Forest, Bowstring State Forest and Welsh Lake State Forest. The shoreline is undeveloped with the exception of a public access on the southwest end. Lake Thirteen has a surface area of 470 acres with a maximum depth of 50 feet and at least 70 percent of the lake less than 15 feet deep (Fig. 4).

Figure 4. Hydrologic contour map of Lake Thirteen, Cass County, Minnesota (MnDNR 1989).



Lake Thirteen is a hard-water lake with primarily sandy shoal substrates (MnDNR Fisheries Lake Files). Water clarity, as recorded by secchi disc, has been recorded from seven feet (Peterson 1957) to 12.5 feet (Arola 1979) and water color has been reported as greenish due to planktonic algae.

Vegetation Survey Objectives

The purpose of the 2004 survey of Lake Thirteen is to describe the current aquatic plant community including:

- 1) Estimate the maximum depth of rooted vegetation
- 2) Estimate the percent of the lake occupied by rooted vegetation
- 3) Record the aquatic plant species that occur in the lake
- 4) Estimate frequencies of occurrence of individual species
- 5) Develop maps of the distribution of the common species

Data from the 2004 vegetation surveys can be used to monitor annual changes in the plant species community and may also be used to guide vegetation management decisions.

Methods

Point-Intercept Survey

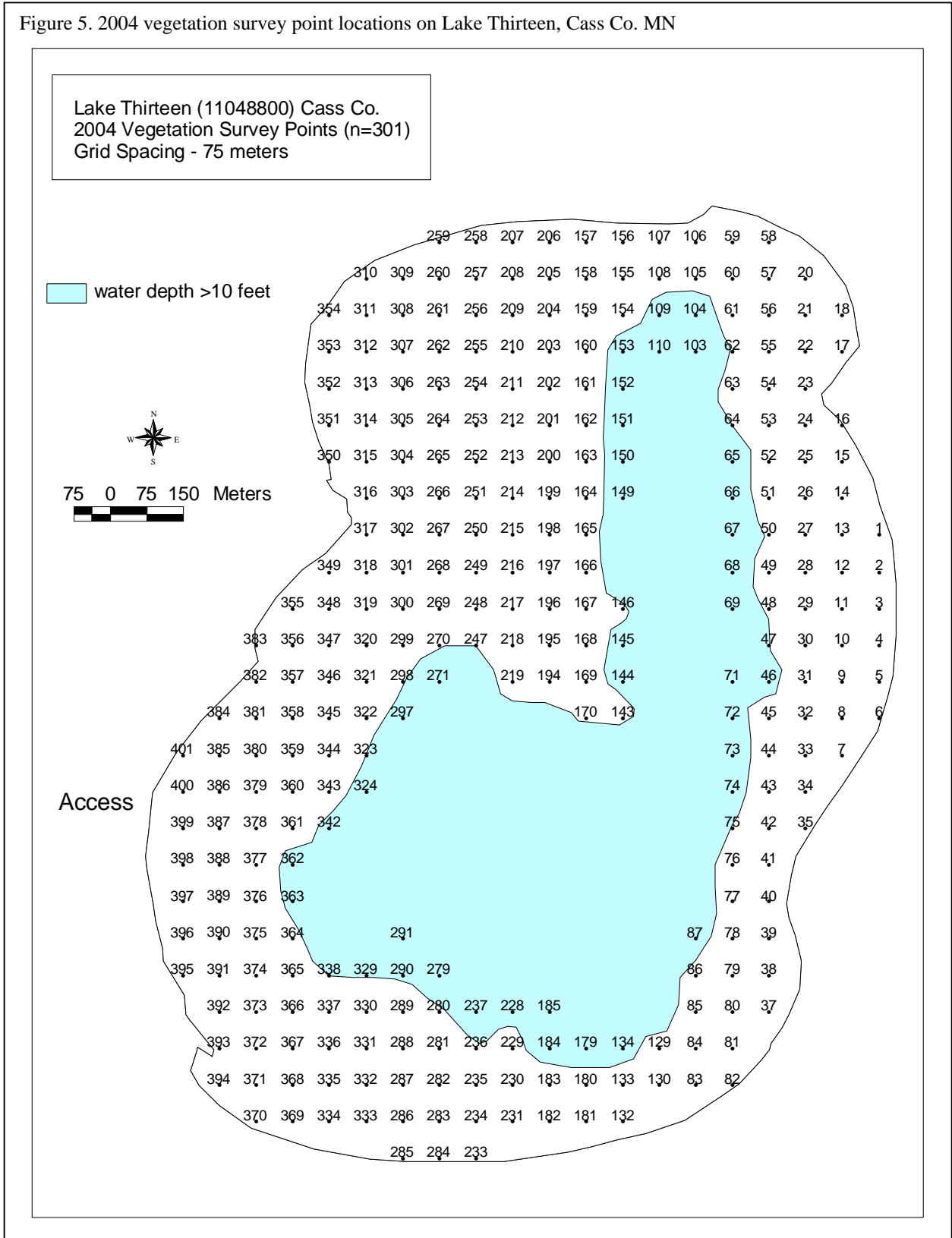
A Point-Intercept vegetation survey of Lake Thirteen was conducted on August 16, 2004 following the methodology described by Madsen (1999). At a minimum, we wanted to sample 100 points within the vegetated zone and place sample point no further than 100 meters apart for mapping purposes. Sample points were established in using ArcView GIS program using a 75 meter by 75 meter grid across the lake surface. In the field, surveyors decided not to sample in depths greater than 15-20 feet because they consistently were not finding vegetation beyond the 10 foot depth. As a result, 301 sites were actually sampled and 265 of those fell within the vegetated zone from shore to the 10 feet depth (Fig. 5).

Survey waypoints were created and downloaded into a Garmin GPS. The GPS unit was used to navigate the boat to each sample point. One side of the boat was designated as the sampling area. At each site, water depth was recorded in one foot increments using a measured stick in water depths less than eight feet and an electronic depth finder in water depths greater than eight feet. The surveyors recorded all plant species found within a one meter squared sample site at the pre-designated side of the boat. A double-headed, weighted garden rake, attached to a rope was used to survey vegetation not visible from the surface (Fig. 6).

Nomenclature followed Crow and Hellquist (2000). Voucher specimens were collected for most plant species.

Data were entered into a Microsoft Access database and frequency of occurrence was calculated for each species as the number of sites in which a species occurred divided by the total number of sample sites.

Figure 5. 2004 vegetation survey point locations on Lake Thirteen, Cass Co. MN



$$\text{Frequency} = \frac{\text{number of sites in which species occurred}}{\text{Total number of sample sites}}$$

Example:

There were 235 sample sites within the shore to 10 feet zone. Muskgrass occurred in 200 of those sample sites.

Frequency of muskgrass = $200/235 = 67$ percent

Frequency was calculated for the entire vegetated zone (0 to 10 feet) and sampling points were also grouped by water depth and separated into two depth zones for analysis: 0 to 5 feet and 6 to 10 feet.

Plant Bed Delineation

The boundaries of major plant beds were estimated using the results of the point-intercept survey and from review of 2003 aerial photographs. This provides a general estimation of plant bed location and size but detailed mapping of plant beds using gps was not conducted.



Figure 6. Rake used to sample vegetation.

Results / Discussion

Maximum Depth of Vegetation and Percent of Lake with Vegetation.

In Lake Thirteen, plants grew to a maximum depth of 10 feet and 77% of the sample sites between shore and the 10 feet depth contained vegetation (Fig. 7).

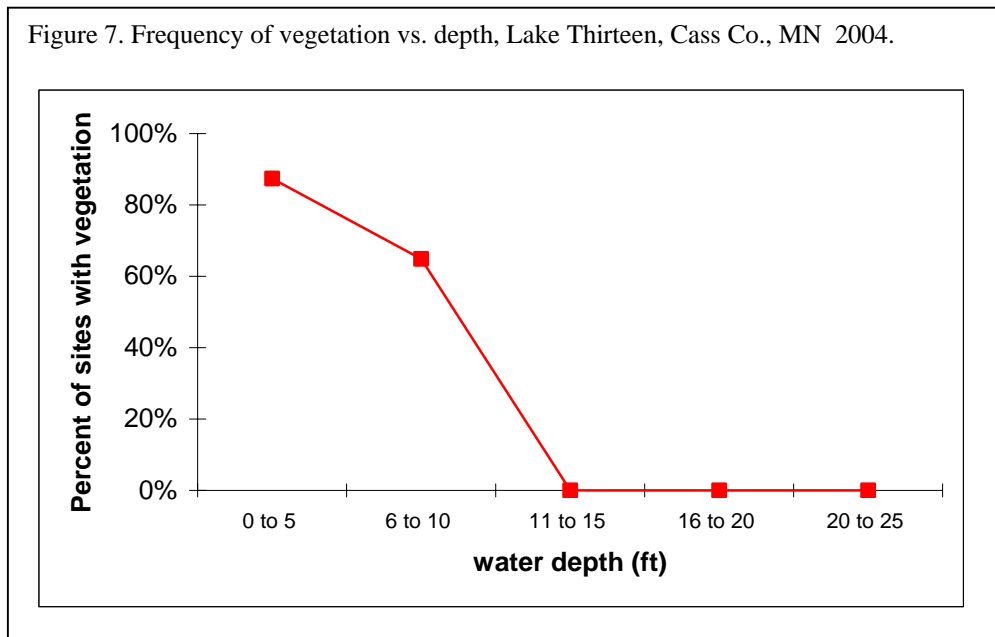


Figure 7. Frequency of vegetation vs. depth, Lake Thirteen, Cass Co., MN 2004.

The major plant beds of Lake Thirteen can be seen on the 2003 aerial photograph (Fig. 8). About 70 percent of the lake supports vegetation with emergent plants growing in scattered beds from shore to a depth of five feet and submerged plants found to a depth of ten feet (Fig. 9).

Figure 8. 2003 Aerial photograph of Lake Thirteen, Cass Co, MN.
(Source Farm Service Administration)

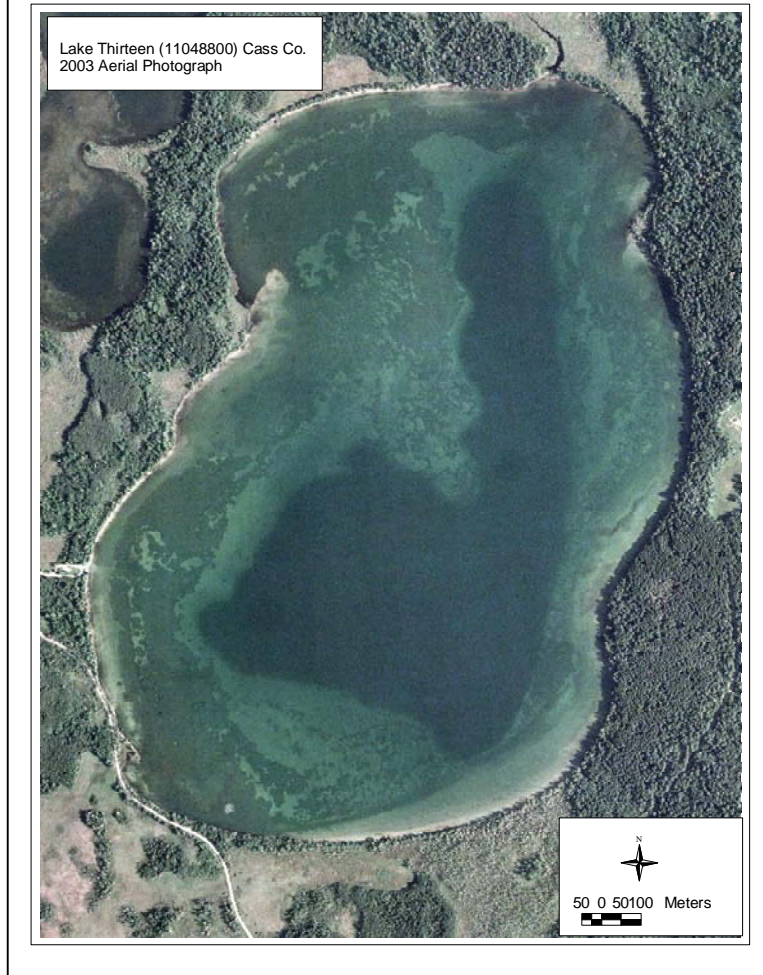
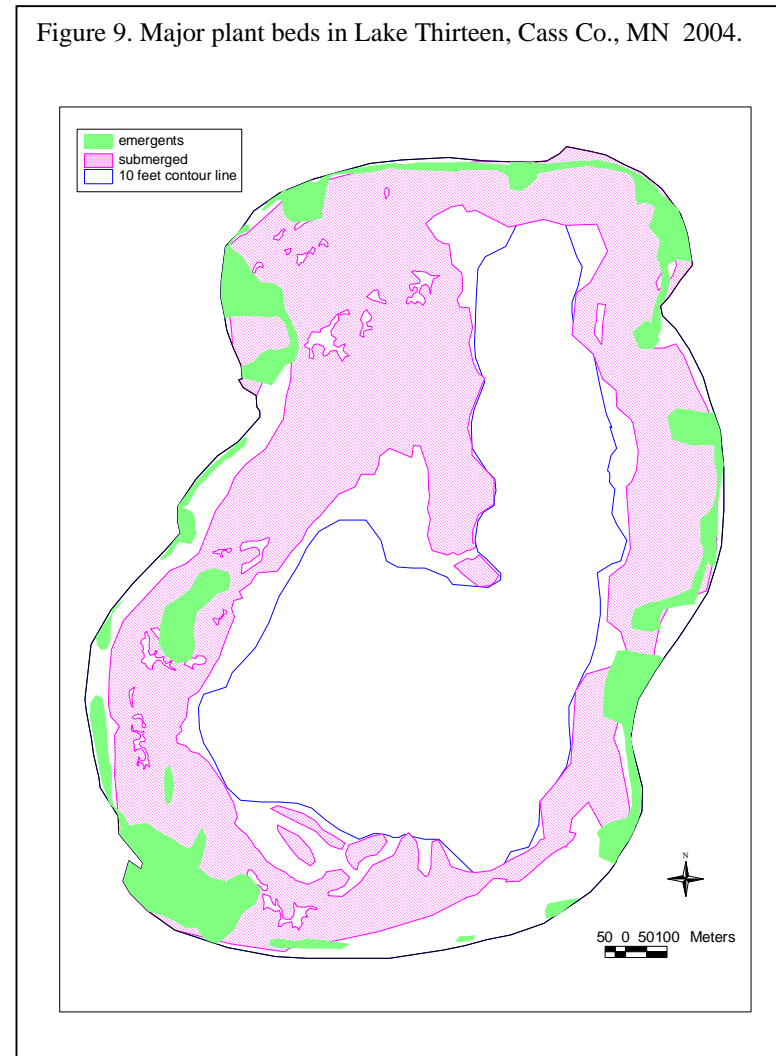


Figure 9. Major plant beds in Lake Thirteen, Cass Co., MN 2004.



Types of aquatic plants found

Eighteen species of native aquatic plant species were located during the 2004 survey, including nine emergents, two floating-leaved, and seven submerged species (Table 1). However, only one or two species were found at most sample sites (Fig. 10).

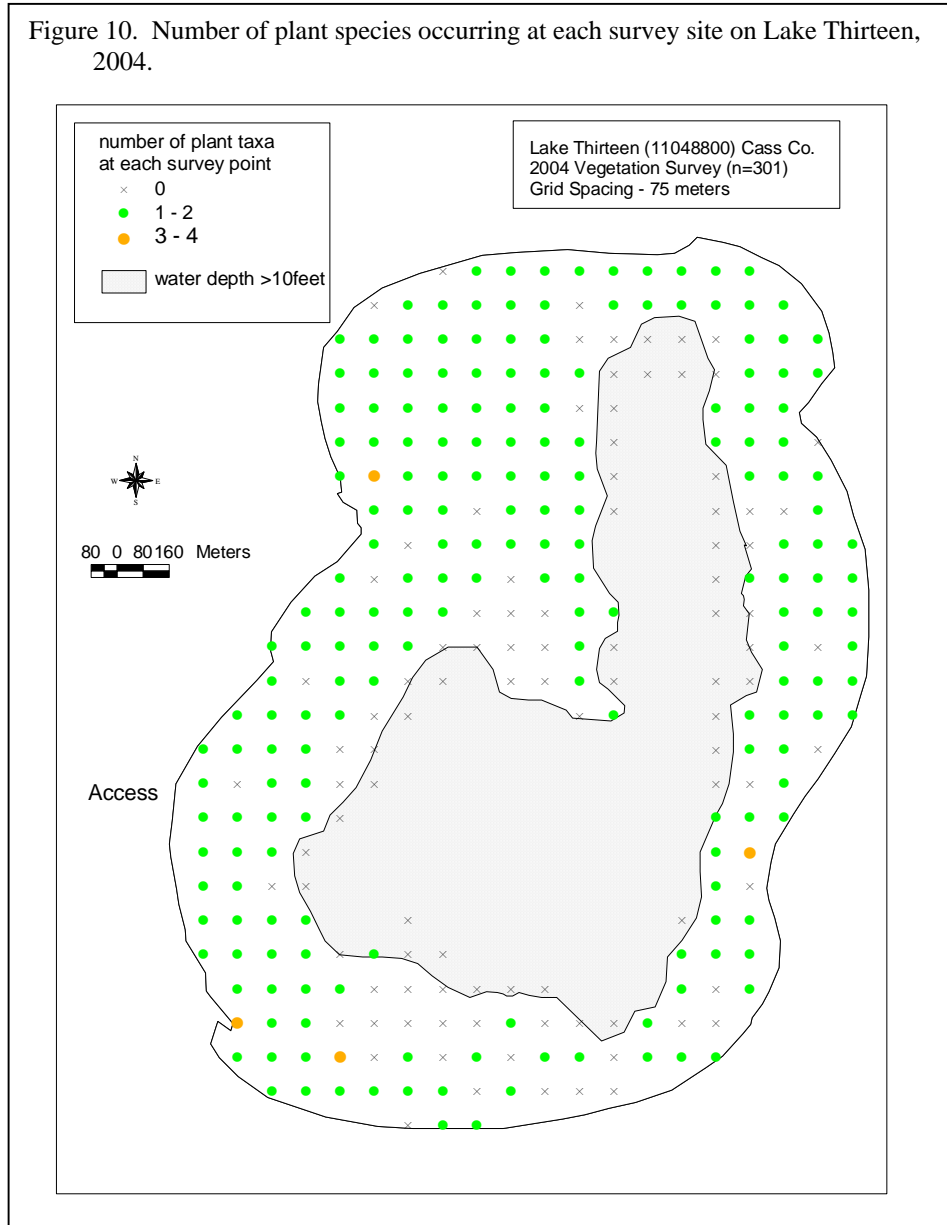
Table 1. Aquatic Plants of Lake Thirteen, Cass County (11-04880-00) August 16, 2004.

Frequency calculated for vegetated zone (shore to 10 feet depth)
 Frequency = percent of sites in which species occurred
 264 sample sites

	Common Name	Scientific Name	Frequency
SUBMERGED These plants grow primarily under the water surface. Upper leaves may float near the surface and flowers may extend above the surface. Plants are rooted or anchored to the lake bottom.	Muskgrass	<i>Chara</i> sp. (v)	76
	Illinois pondweed	<i>Potamogeton illinoensis</i> (v)	3
	Large-leaf pondweed	<i>Potamogeton amplifolius</i> (v)	<1
	Flat-stem pondweed	<i>Potamogeton zosteriformis</i> (v)	present*
	Bushy pondweed	<i>Najas flexilis</i> (v)	present
	Sago pondweed	<i>Stuckenia pectinata</i> (v)	present
	Northern milfoil	<i>Myriophyllum sibiricum</i> (v)	present
FLOATING These plants are rooted in the lake bottom and have leaves that float on the water surface. Many have colorful flowers that extend above the water	Floating leaf pondweed	<i>Potamogeton natans</i> (v)	<1
	White waterlily	<i>Nymphaea odorata</i> (v)	present
EMERGENT These plants extend well above the water surface and are usually found in shallow water, near shore.	Bulrush	<i>Scirpus</i> sp.	10
	Spikerush	<i>Eleocharis</i> sp.	<1
	Giant Cane	<i>Phragmites australis</i>	present
	Arrowhead	<i>Sagittaria</i> sp. (v)	present
	Cattail	<i>Typha</i> sp.	present
WETLAND EMERGENTS These plants grow along shore and may extend into wet soils.	Smartweed	<i>Polygonum</i> sp.	present
	Jewelweed	<i>Impatiens capensis</i>	present
	JoePye weed	<i>Eupatorium maculatum</i>	present
	Swamp Milkweed	<i>Asclepias incarnata</i>	present

* present indicates plant was found during survey but did not occur within a specific sample site.
 (v) = voucher specimen collected

Figure 10. Number of plant species occurring at each survey site on Lake Thirteen, 2004.



Submerged plants

Muskgrass (*Chara* sp.) (Fig. 11) dominated the submerged plant community. Muskgrass is actually an algae that grows in large colonies and resembles higher plants. Unlike higher plants, it does not form true roots, stems or flowers. Muskgrass is named for the “musky” odor and can also be recognized by its rough, brittle texture.

Figure 11. Muskgrass (*Chara* sp.)



Figure 12. Bed of Muskgrass (*Chara* sp.)



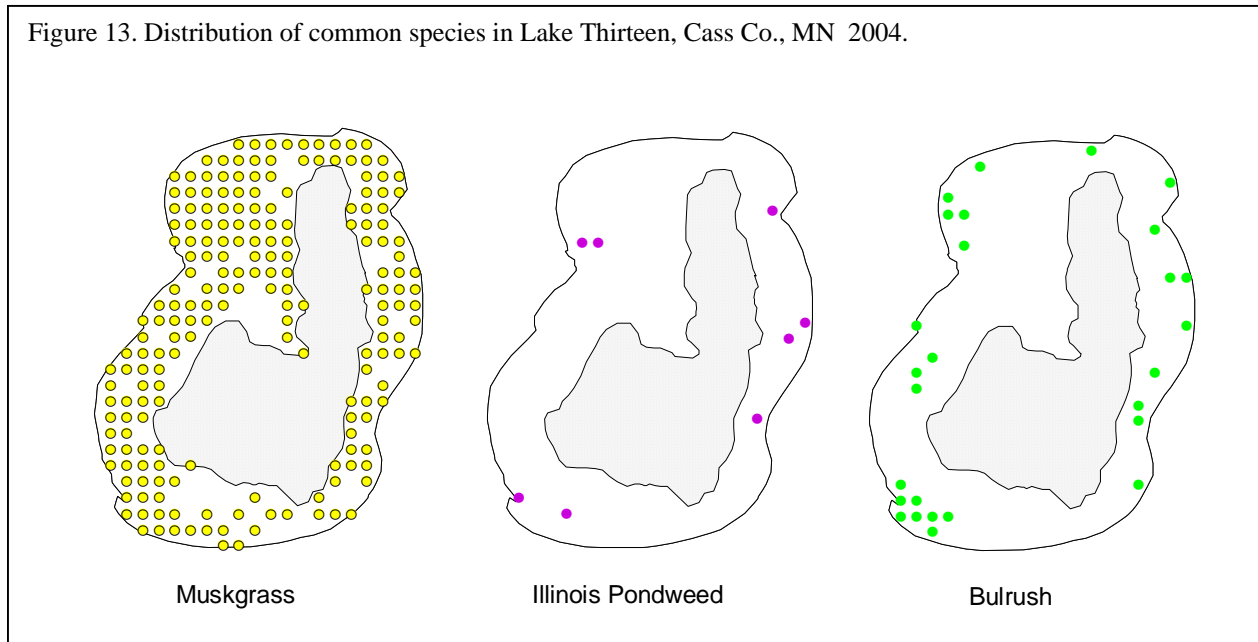
Geologically, Lake Thirteen occurs within the Bemidji Sandplain and much of the lake bottom is sandy. Muskgrass grows well on sandy or sandy-silty lake bottoms and can withstand moderate to heavy wave activity. In Lake Thirteen, muskgrass grows as a low-growing “carpet” along the lake bottom and does not typically reach the water surface.

Beds of muskgrass (Fig. 12) provide critical cover and food, particularly for young fish. It is also a good food source for waterfowl. Invertebrates found within beds of

muskgrass provide additional grazing for fish and waterfowl.

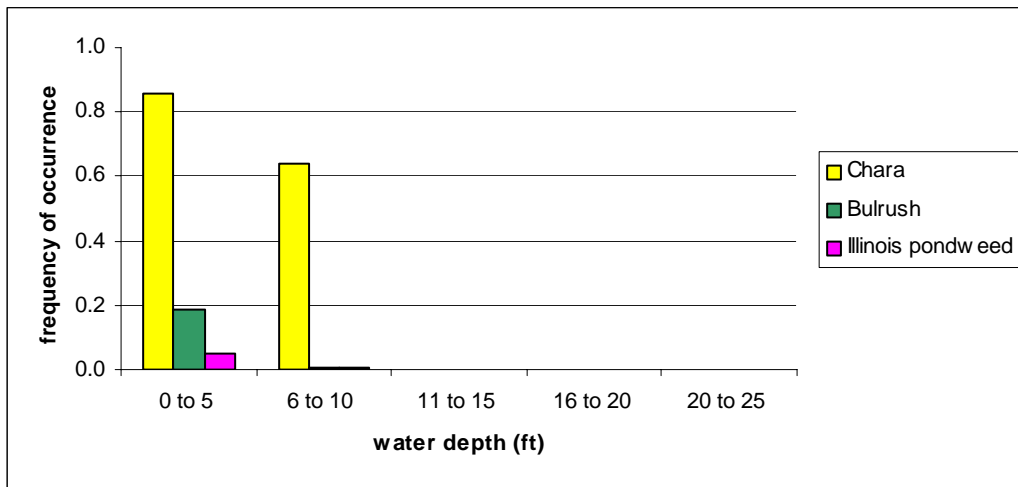
In Lake Thirteen, muskgrass occurred in 76 percent of the sites within the vegetated zone (shore to 10 feet) (Fig. 13). It was most abundant from shore to a depth of five feet, where it was found in 86 percent of the sample sites (Fig. 14). In depths of six to ten feet, it was found in 64 percent of the sites.

Figure 13. Distribution of common species in Lake Thirteen, Cass Co., MN 2004.



Other submerged plants that were found in Lake Thirteen included Illinois pondweed (*Potamogeton illinoensis*), [large-leaf pondweed](#) (*P. amplifolius*), sago pondweed (*Stuckenia pectinata*), flat-stem pondweed (*P. zosteriformis*), [bushy pondweed](#) (*Najas flexilis*) and [northern watermilfoil](#) (*Myriophyllum sibiricum*). These pondweed and milfoil species were a minor component of the lake plant community, occurring in less than three percent of the survey sites (Table 1) and generally found in depths less than six feet (Fig.14).

Figure 14. Abundance of common plant species at different depths. Lake Thirteen, Cass Co., MN. 2004.



However, the areas of the lake where these mixed beds do occur are very important. While the muskgrass forms low mats, the pondweeds and milfoils grow taller in the water column, providing additional cover for fish and invertebrates and their seeds are a favorite food source for waterfowl (Fig. 15).

Floating-leaved plants

Floating-leaved species are not common in Lake Thirteen and were found in less than one percent of the sample sites. Floating-leaf pondweed (*Potamogeton natans*) and [white waterlily](#) (*Nymphaea odorata*) (Fig. 16) were mostly found in water less than five feet deep.

Figure 15. Mixed beds of pondweeds (*Potamogeton* spp).



Figure 16. White waterlily (*Nymphaea odorata*).



Emergent plants

Bulrush (*Scirpus* sp.) was the most common emergent plant in Lake Thirteen (Fig. 17). It was found in ten percent of the sample sites and occurred in scattered beds around the entire lake to a depth of about five feet (Fig. 11). Other emergents included spikerush (*Eleocharis* sp.), Arrowhead (*Sagittaria* sp.), Giant cane (*Phragmites australis*), and cattail (*Typha* sp.). Several wetland species that were found are also listed in Table 1, but a thorough survey of surrounding wetlands was not conducted.

Factors influencing the Lake Thirteen plant community and monitoring change over time

Historical vegetation data for Lake Thirteen is sparse, but comparison of the 2004 data with previous surveys indicates that little change has occurred in the aquatic plant community. In 1979, muskgrass was recorded as abundant with occasional mixed pondweed beds, primarily on the north side of the lake, and bulrush was found scattered around the lake (Arola, 1979). A 1957 survey also found muskgrass as the dominant submerged species and bulrush as the main emergent species (Peterson, 1958). Between 1922 and 1930, U.S. Dept. of Agriculture waterfowl biologists surveyed vegetation in eighteen other Cass County Lakes (Hotchkiss 1932). Their surveys did not include Lake Thirteen, but they do provide a general description of Cass County Lakes before current shoreline development conditions. Common species included muskgrass, floating leaf pondweed, clasping-leaf pondweed, wild rice, bulrush and white and yellow waterlilies. Lakes with hard sand or gravel bottoms had sparse vegetation while lakes with muck or muck with some sand, bottoms had abundant vegetation.

The lake conditions of Lake Thirteen greatly influence the types and abundance of aquatic plants found there. Muskgrass and bulrush grow well in the sandy substrate. Bog-stained water limits the amount of light that reaches the lake bottom and limits plants to depths of ten feet and less. Because the lake water level is relatively stable, the distribution of aquatic plants is not expected to change greatly from year to year.

The 2004 vegetation survey gives a “snapshot” of the Lake Thirteen conditions. Data collected during the 2004 survey can be compared to future quantitative surveys of Lake Thirteen to better estimate how the plant community may be changing. Monitoring changes in aquatic plant communities can help reflect changes in the overall water quality of the lake and watershed.

Figure 17. Bulrush (*Scirpus* sp.)



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